WHAT IS CLAIMED IS:

1. Apparatus from monitoring and controlling downhole equipment, comprising:

   (a) a hydraulic line extending into a wellbore for supplying fluid under pressure downhole carried on the tubing;

   (b) a plurality of fiber optic sensors providing measurements of a downhole parameter along the tubing; and;

   (c) a hydraulically-controlled device on the tubing and in fluid communication with the hydraulic line, wherein said hydraulic line provides both the monitoring of the downhole parameter and the control of the hydraulically-operated device.

2. The apparatus of claim 1 wherein the fiber optic sensors and disposed inside the hydraulic line.

3. The apparatus of claim 1 wherein the hydraulic line is a return line extending from a surface location to the hydraulically-operated device.

4. The apparatus of claim 1 wherein the hydraulically-operated device is selected from a group consisting of (a) flow control device, (b) a packer, (c) a choke, (d) a perforating device, (e) an anchor, (f) a completion device, and (g) a production device.

5. The apparatus of claim 1 wherein the downhole parameter is one of (a) temperature, (b) pressure, (c) vibration, (d) acoustic measurement, (e) fluid flow, and (f) a fluid property.

6. The apparatus of claim 1 wherein the plurality of sensors include at least one of (a) temperature sensor, (b) pressure sensor, (c) acoustic sensor, (d) flow measurement sensor, and (f) vibration sensor.

7. A method of monitoring a downhole parameter and controlling a hydraulically-operated device, comprising:

(a) providing a hydraulically-operated device in a wellbore;

(b) conveying a hydraulic line in downhole, said hydraulic supplying fluid under pressure to the hydraulically -operated device for controlling the operation of the hydraulically-operated device.

(c) providing a fiber optic sensor in the hydraulic line for measuring a downhole parameter along the hydraulic line so that the same hydraulic line provides measurement for the downhole parameter and the control of the hydraulically-operated device.

8. A method of controlling production from a wellbore, comprising:

(a) providing a producing string carrying an electrical submersible pump for pumping wellbore fluid to the surface, said string carrying a high voltage

line from a surface location to the pump or providing electrical power to the pump; and

(b) providing an optical fiber carrying at least one fiber optic sensor along the high voltage lien for taking measurements of a wellbore parameter.

9. The method of claim 8 wherein at least one fiber optic sensor is placed below the pump.

10. The method of claim 9, wherein the sensor below the pump is selected from a group consisting of a (a) pressure sensor, (b) temperature sensor, (c) vibration sensors, and (d) flow measurement sensor.

11. The method of claim 8 further comprising controlling the operation of the electrical submersible pump in response to the downhole parameter.

12. The method of claim 11 wherein the downhole parameter is one of (a) temperature of the pump, (b) vibration of the pump, and (c) fluid flow by the pump.

13. An apparatus for monitoring the condition of an electric power line supplying high electric power into a wellbore, comprising:

(a) a conduit extending into the wellbore;

(b) an electric powerline in the conduit carrying high electric power to a

location in the wellbore; and,

(c) a plurality of fiber optic sensors distributed along and adjacent the electric powerline, said fiber optic sensors providing measurements representing a physical condition of the electric powerline.

14. A system for controlling a downhole device in a wellbore comprising:

(a) a fiber optic sensor in the wellbore providing measurements for a downhole parameter;

(b) a source of power for supplying power to operate the downhole device; and,

(c) a controller providing signals responsive to the fiber optic sensor measurements.

15. The system of claim 14 wherein the source of power is one of (a) operating the downhole device, (b) light energy and (c) hydraulic power.

16. A downhole injection evaluation system comprising:

a) at least one downhole sensor permanently disposed in an injection well for sensing at least one parameter associated with injecting a fluid into a formation.

17. A downhole injection evaluation system as claimed in claim 16 wherein said

system further includes an electronic controller operably connected to said at least one downhole sensor.

18. A downhole injection evaluation system as claimed in claim 17 wherein said at least one downhole sensor is operably connected to at least one production well sensor to provide said electronic controller, operably connected to said at least one downhole sensor and to said at least one production well sensor, with information from both sides of a fluid front moving between said injection well and said production well.

19. A system for optimizing hydrocarbon production comprising:

a) a production well;

b) an injection well, said production well and said injection well being data transmittably connected;

c) at least one sensor located in either of said injection well and said production well, said at least one sensor being capable of sensing at least one parameter associated with an injection operation, said sensor being operably connected to a controller for controlling injection in the injection well.

20. An automatic injection/production system comprising:

a) an injection well having at least one sensor and at least one flow

controller;

b) a production well having at least one sensor and at least one flow controller;

c) at least one system controller operably connected to said sensors and said fluid controllers whereby said system controllers controls said flow controllers according to information received by said sensors.

21. A downhole injection evaluation system as claimed in claim 17 wherein said system further includes at least one downhole acoustic signal generator whereby signals generated by said at least one signal generator reflect off a flood fluid/hydrocarbon interface and are received by said at least one downhole sensor.

22. An injection well having at least one fiber optic cable disposed therein in a location advantageous to irradiate a portion of the strata of the formation immediately surrounding the well to measure fluorescence of bacteria present.

23. A method for avoiding injection induced unintentional fracture growth comprising:

a) providing at least one acoustic sensor in an injection well;

b) monitoring said at least one sensor;

c) varying pressure of a fluid being injected to avoid a predetermined threshold level of acoustic activity received by said at least one sensor.

24. A method for enhancing hydrocarbon production wherein at least one injection well and an associated production well include at least one sensor and at least one flow controller comprising:

a) providing a system capable of monitoring said at least one sensor in each of said wells and controlling said at least one flow controller in each of said wells in response thereto to optimize hydrocarbon production.

25. An apparatus for controlling chemical injection of a surface treatment system for an oilfield well, comprising:

(a) a chemical injecting device injecting one or more chemicals into the treatment system for the treatment of fluids produced from an oilfield well;

(b) at least one chemical sensor associated with the treatment system for sensing at least one parameter of the injected chemical or for sensing at least one chemical property of the fluids produced from the oilfield well; and

(c) a control and monitoring system for controlling the chemical injection device in response, at least in part, to information from said downhole chemical sensor.

26. The apparatus of claim 25 further comprising at least one additional sensor

distributed in said treatment system for measuring at least one of pressure, temperature and flow, said distributed sensors communicating with said control system.

27. The apparatus of claim 26 wherein said distributed sensor comprises at least one fiber optic sensor.

28. The apparatus of claim 25 wherein said control system includes a computerized controller.

29. The apparatus of claim 25 wherein said chemical sensor is a fiber optic sensor.

30. The apparatus of claim 29 wherein said fiber optic downhole chemical sensor includes a probe which is sensitive to at least one selected chemically related parameter.

31. The apparatus of claim 30 wherein said probe includes a sol gel sensor.

32. The apparatus of claim 6 wherein said fiber optic downhole sensor includes a spectrometer in communication with said probe.

33. A method of monitoring chemical injection into a surface treatment system of an

oilfield well, comprising:

(a) injecting one or more chemicals into the treatment system for the treatment of fluids produced in the oilfield well;

(b) sensing at least one chemical property of the fluids in the treatment system

(c) using at least one chemical sensor associated with the treatment system.

34. The method of claim 33 wherein said chemical sensor is a fiber optic sensor.

35. The method of claim 34 wherein said fiber optic chemical sensor includes a probe which is sensitive to at least one selected chemically related parameter.

36. The method of claim 35 wherein said probe includes a sol gel sensor.

37. A light actuated system for use in a wellbore, comprising:

(a) a light actuated transducer in the wellbore, said light actuated transducer adapted to transform a physical state of a component thereof upon application of optical energy;

(b) an optical waveguide conveying the optical energy from a source thereof to the light actuated transducer; and

(c) a control device in the wellbore operated at least in part by the said change in the physical state of the component of the light actuated transducer.

38. The light actuated system of claim 37, wherein said transformation of the physical state is selected from the set consisting of (i) mechanical motion of the component, and (ii)a change in the physical properties of the component.

39. The light actuated system of claim 37 wherein the optical waveguide is one of (i) an optical fiber, and (ii) a fluid-filled waveguide.

40. The light actuated system of claim 37 wherein the control device is one of (i) a fluid control device, (ii) an electronic power generation device, (iii) an electrical switching device, (iv) a fluid pressuring device, (v) a downhole light source, and (vi) an energy sensitive material that changes physical properties.

41. The light actuated system of claim 40 further comprising an end use device controlled at least in part by the control device, said end use device being one of (i) flow control equipment, (ii) lifting equipment, (iii) injection equipment, (iv) perforating equipment, (v) packer, (vi) fluid separating equipment, (vii) sensing equipment, (viii) pump, and (ix) fluid treatment equipment.

42. The light actuated system of claim 37 wherein transformation of the physical state includes the movement of a fluid and the source of the fluid is one of (i) a pressurized fluid supplied from a surface location, (ii) pressurized fluid supplied from the surface via a conduit carrying the optical waveguide to the light actuated

system, and (iii) wellbore fluid at hydrostatic pressure.

43. The light actuated system of claim 42 wherein the fluid is enclosed in a chamber having a reciprocating piston therein, said piston reciprocating due to the expansion of the fluid upon application of optical energy.

44. The light actuated system of claim 40 wherein the transformation of the physical state includes the conversion of the optical energy to motion of a piezoelectric material carrying the electrical energy.

45. The light actuated system of claim 37 further comprising at least one sensor in the wellbore providing measurements of at least one selected downhole parameter.

46. The light actuated system of claim 37 wherein the downhole parameter is one of (a) temperature, (b) pressure, (c) vibration, (d) acoustic field, and (e) corrosion.

47. The light actuated system of claim 37 further comprising a plurality of fiber optic sensors for making distributed measurements.

48. The light actuated system of claim 37 further comprising a processor adapted to provides signals responsive to downhole parameters for controlling a downhole device.

49. A method for producing formation fluids through a wellbore, comprising:

(a) providing a light actuated transducer in the wellbore, said light actuated transducer adapted to transform a physical state of a component thereof upon application of optical energy;

(b) providing a control device in the wellbore that is operated at least in part by said change in the physical state of the component of the light actuated transducer ; and

(c) supplying optical energy to the light actuated transducer, causing said light actuated transducer to change the physical state of the component thereof, thereby operating the control device.

50. The method of claim 49 further comprising providing a conduit from the surface to the light actuated transducer and the control device, said conduit carrying an optical waveguide for supplying the optical energy to the light actuated transducer and providing a path for supplying fluid under pressure to a device in the wellbore.

51. The light actuated system of claim 45 wherein the at least one sensor comprises a plurality of spaced apart sensors.

52. A method of generating electric power in a wellbore, comprising:

(a) placing a light cell at a desired depth in the wellbore, said light cell generating electric energy upon receiving light energy; and

(b) supplying light energy from a source thereof to the light cell for generating the electrical energy downhole.

53. The method of claim 52 further comprising charging and electric energy storage device in the wellbore with the electrical energy produced by the light cell.

54. The method of claim 53 further comprising providing an electrically-operated device in the wellbore and operating said device utilizing the electrical energy from the storage device.

55. The method of claim 54 wherein the electrically-operated device is selected from the group consisting of a (a) sliding sleeve, (b) choke, and (c) a flow control device.

56. The method of claim 52 further providing light energy to the light cell via optical fiber conveyed from the surface.

57. The method of claim 7 wherein the hydraulically-operated device is selected from a group consisting of (a) flow control device, (b) a packer, (c) a choke, (d) a

perforating device, (e) an anchor, (f) a completion device, and (g) a production device.

58. The method of claim 7 wherein the downhole parameter is one of (a) temperature, (b) pressure, (c) vibration, (d) acoustic measurement, (e) fluid flow, and (f) a fluid property.

59. The method of claim 7 wherein the fiber optic sensor is selected from the set consisting of (a) temperature sensor, (b) pressure sensor, (c) acoustic sensor, (d) flow measurement sensor, and (f) vibration sensor.